



PRESERVING OUR TRANSPORTATION INFRASTRUCTURE



2006 ANNUAL REPORT TRANSPORTATION ASSET MANAGEMENT COUNCIL

May 2007

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PREFACE

“The department and each local road agency shall keep accurate and uniform records on all road and bridge work performed and funds expended for the purposes of this section, according to the procedures developed by the council. Each local road agency and the department shall annually report to the council the mileage and condition of the road and bridge system under their jurisdiction and the receipts and disbursements of road and street funds in the manner prescribed by the council, which shall be consistent with any current accounting procedures. An annual report shall be prepared by the staff assigned to the council regarding the results of activities conducted during the preceding year and the expenditure of funds related to the processes and activities identified by the council. The report shall also include an overview of the activities identified for the succeeding year. The council shall submit this report to the state transportation commission, the legislature, and the transportation committees of the house and senate by May 2 of each year.” MCL 247.659(a)(9)

The Transportation Asset Management Council (Council) was appointed by the State Transportation Commission on September 26, 2002. It is the intent of the Council to analyze and report to the Legislature and State Transportation Commission on the current condition of the federal-aid eligible roads and bridges and the investments made to this system. In this way, you will be kept up-to-date on the overall condition of our roads and bridges; how we as road agencies are spending the public dollars you have entrusted to us; and the system needs for maintaining and preserving our roads and bridges. This is the fifth report submitted by the Council.

This report was approved by the Asset Management Council at their May 1, 2007 meeting.

Executive Summary

- This is the fifth annual report submitted by the Transportation Asset Management Council in accordance with the provisions of MCL 247.659a. Significant progress has been made since the passage of the law in 2002, particularly in the area of educating and training agencies about asset management. However, we are still in the early stages of implementing asset management throughout the state. A number of agencies have begun asset management programs and many others are in the process of starting their own programs. Because asset management is a new concept it is too early to see results of these efforts on a statewide basis. Ultimately, the greatest impact will be achieved as more and more agencies incorporate the principles of asset management into their everyday activities.
- A number of agencies such as Kent County Road Commission, Cass County Road Commission, Calhoun County Road Commission, the cities of Marquette, Three Rivers, Romulus, and Gladstone, and MDOT have demonstrated that using asset management principles can extend the existing service life of roads and bridges; help to meet agency goals; and assist in securing additional funding.
- Asset management is “an on-going process of maintaining, upgrading and operating physical assets cost-effectively, based on a continuous, physical inventory and condition assessment.” [MCL 247.659(a)]
- The heart of asset management is a sound capital preventive maintenance program (CPM). The correct approach to CPM is to place the right fix, in the right place, at the right time. What a CPM program attempts to do is to ensure that an agency gets the full service life out of the repair. A dollar spent on CPM can postpone costly repairs on major rehabilitations and reconstructions. CPM fixes can cost on an average \$55,000 per lane mile while a fully reconstructed road costs \$1.2 million per lane mile.
- There has been a significant growth in agencies employing some aspect of asset management during the last four years. For example, in 2003, 66 communities were using RoadSoft, a pavement management system that assists an agency in doing asset management. Today there are over 230. In 2006, the

Legislature encouraged communities to adopt asset management plans. So far, nine communities have state approved asset management plans and another 20 or so are in the process of putting one together. To do more we need to educate communities on the value of an asset management process.

- The 2006 condition of the state's federal-aid roads shows that 21,222 lane miles need to have some type of major rehabilitation or reconstruction. This is nearly $\frac{1}{4}$ of the total federal aid system. This is an increase in this category of 85% since 2004. The overall condition of the system is getting significantly worse with as many miles in poor condition as in good condition.
- With respect to the condition of bridges, bridges on the arterial system are improving slightly, while those on the collector system are declining. One of the reasons for this situation is that MDOT (which owns most of the bridges on the arterial system) has adopted a CPM program. Most local agencies (which own the bulk of the collector system) do not have sufficient funds to do CPM, so they wait until the bridge has to be replaced at a significantly higher cost.
- In 2005, total investments in the system were nearly \$2.83 billion, with \$1.95 billion going to improve the condition of the roads and \$210 million for bridges. The remainder went to routine maintenance or traffic and safety projects.
- Projected road condition, using 2005 data (the last year for which complete data is available) shows that by 2015, 22,731 lane miles will need to have major rehabilitation work or reconstruction done to them; but we will only be able to do 876 lane miles. Projected bridge condition shows a slight improvement on state bridges but a continual decline on local bridges.
- The Council is required by law to recommend a statewide asset management strategy to the State Transportation Commission. There can be different elements to a strategy and the Council is recommending a strategy regarding the areas of education and local bridges.
- Recommended Strategy for Education and Training: The Council recommends that an on-going, comprehensive educational and training program be conducted that provides local and state road agencies with the information needed for them to develop and implement their own asset management programs.

- Recommended Strategy for Local Bridges: The Council recommends that local agencies be encouraged to implement capital preventive maintenance activities for the bridges under their jurisdiction.

An Overview of Asset Management

Asset management as defined in Michigan is **“an ongoing process of maintaining, upgrading and operating physical assets cost-effectively, based on a continuous, physical inventory and condition assessment.”** [MCL 247.659(a)]

Asset management involves collecting physical inventory and managing current conditions based on strategic goals and sound investments. It is a continuous, iterative process enabling managers to evaluate various scenarios, determine trade-offs between different actions, and select the best method for achieving specified goals.

Traditionally, public sector management of roads and bridges has been tactical in nature, concentrating on the immediate and most severe problems. Asset management shifts that thinking to one that is strategic in nature. Decisions are made with regard to the long-range condition of the entire system rather than individual projects. This requires considering various investment strategies which will maintain the assets in good condition.

It is crucial in an asset management process to have the ability to forecast future road and bridge conditions and perform investment analyses based on various funding and fix scenarios. The strategic component of the process focuses on network level analysis. This component takes into consideration:

- Current condition of the transportation system and its future condition if there is no change in current practices;
- Future condition based on alternative strategies;
- The best time to maintain, preserve, or improve to get maximum useful life from a transportation asset;
- Use of preventive fixes or allow an asset to deteriorate to the point of requiring reconstruction;
- Costs and benefits of each decision; and
- Relationship to identified goals and objectives.

The key is the conscious effort required to create and analyze alternatives. **It is necessary to focus attention on effectively and efficiently managing and operating our transportation system rather than merely reconstructing it.**

The fundamental elements of an asset management process include:

- Conduct periodic system condition inventories;

- Identify needs by forecasting system conditions based upon reliable rates of deterioration;
- Establish strategic goals and objectives, and performance measures;
- Evaluate investment scenarios based upon forecasted conditions and achievement of goals and objectives;
- Develop and implement a multi-year investment program; and
- Routinely monitor the performance of the system improvements.

What Causes a Road to Deteriorate?

According to the American Association of State Highway and Transportation Officials (AASHTO) : “Those who work with pavements know that after a pavement is built, traffic and environmental loadings create unavoidable stress that will eventually reduce the condition of the roads to a point where they will not be usable without maintenance.” (“Executive Summary Report: Pavement Management Guide,” AASHTO, November 2001, pp. 1-2) These factors include weather, materials used, traffic loadings (weight), and aging of the pavement (oxidation). Pavement experts also know that early maintenance treatment can extend the useful service life of some pavements.

When you design and construct/reconstruct a road, you generally expect to get 20 to 25 years of useful service until you need to consider major rehabilitation or reconstruct it. The life cycle performance of a highway depends upon the type, time of application, and quality of the maintenance it receives. There are basically three groups of maintenance: routine, capital preventive and reactive maintenance. Routine maintenance consists of the on-going, planned activities such as snow removal, street sweeping, crack sealing, and mowing. Capital preventive maintenance activities protect the pavement and decrease the rate of deterioration of the pavement quality. Reactive maintenance activities are performed to correct a specific pavement problem such as potholes.



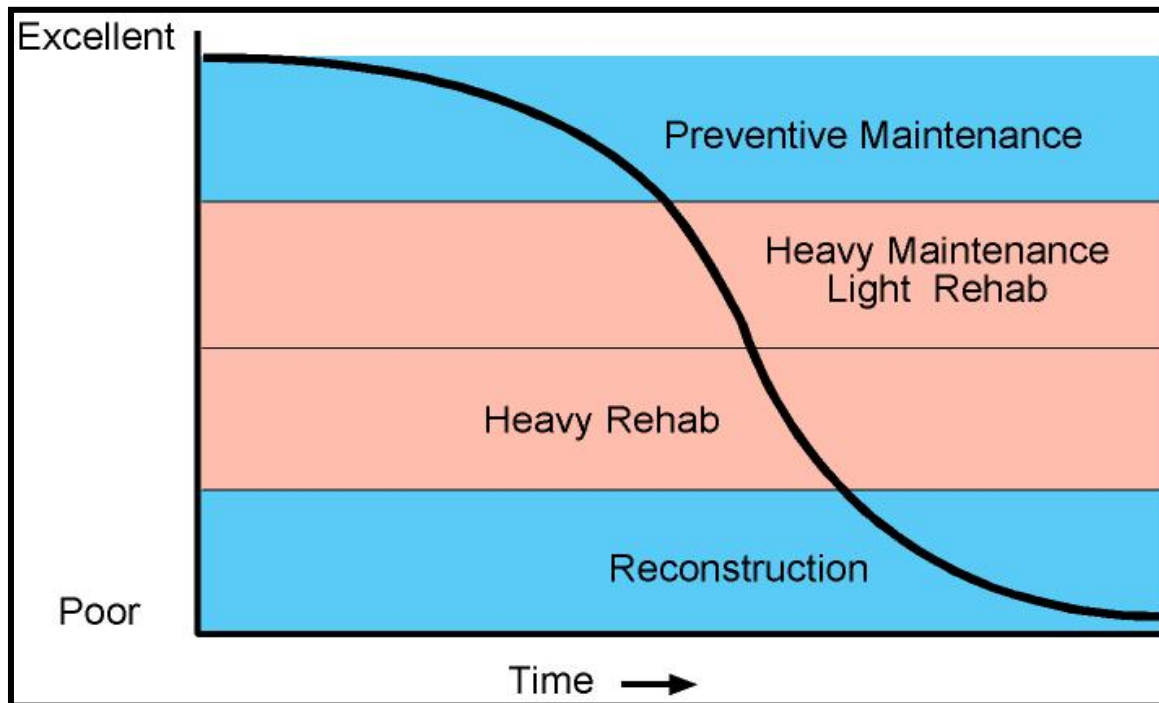
Delays in applying maintenance fixes increase the severity of pavement defects and increase the costs to correct those defects. Then when the defect is corrected, the cost is much greater. According to the National Center for Pavement Preservation at Michigan State University delaying preservation fixes for even one year can cost a pavement 5 to 6 years of service life. (*Pavement Preservation: Applied Asset Management*, National Center for Pavement Preservation, Department of Civil and Environmental Engineering, MSU, November 2006, p. 1-2)

The heart of asset management is a sound capital preventive maintenance program (CPM). Act 51 defines preventive maintenance as “a planned strategy of cost-effective treatments to an existing roadway system and its appurtenances that preserve assets by retarding deterioration and maintaining functional condition without significantly increasing structural capacity.” [MCL 247.660(c)] With CPM what we are trying to do is **minimize** the effects of the elements on **road deterioration** and thus ensure that we get the full 20 to 25 years of service from the road. And in some instances, if done properly, we may even get a few more years before we have to reconstruct. This is extremely important in an era of tight funding because studies have shown that **for every dollar spent on capital preventive maintenance you can delay spending \$4 to \$6 dollars on reconstruction.**

The purpose of a CPM program is to protect the pavement structure, slow the rate of deterioration and correct surface deficiencies. The National Center for Pavement Preservation notes that: “In the past, many preventive maintenance practices have not been effective because they were applied reactively to roads in poor condition instead of proactively to roads still in good condition. The correct approach to preventive maintenance is to **‘place the right treatment on the right road at the right time.’** Traditional approaches waited until deficiencies became evident, even to the untrained observer, at which time, the road agency was trapped into the unfavorable choice of either applying major rehabilitation or complete reconstruction. By the time deficiencies become evident to the observer, irreversible underlying structural damage has often already occurred and it is too late to apply preventive treatments.” (*Pavement Preservation: Applied Asset Management*, National Center for Pavement Preservation, Department of Civil and Environmental Engineering, MSU, November 2006, p. 1-3)

Pavement experts know that there is “window of opportunity” in which certain types of treatments are more feasible to use than others. The following exhibit illustrates this concept. The curved line shows how a pavement deteriorates over time. There are certain points along the curve where different types of work activities no longer become feasible. These points define the window of opportunity. For example, there is a

point on the steep part of the curve where maintenance and light rehabilitation work are no longer economically feasible. Beyond this point, heavy rehabilitation is recommended until you reach the point where the only thing that can be done is to reconstruct the road.



The portion of the exhibit in pink is the area where capital preventive maintenance activities take place with the most effectiveness. With tight budgets and scarce funds, agencies need to optimize the performance of their existing systems. A capital preventive maintenance program can help them do this. A CPM program is designed to extend the life of good pavements by applying lower cost treatments. These slow the rate of deterioration.

CPM is perhaps the single most influential component in a network strategy which allows an agency to manage pavement condition. It creates the ability to postpone costly reconstruction activities by extending the remaining service life of the original pavement. Capital preventive maintenance fixes can generally extend the service life of a given road by 3 to 10 years, depending on the actual fix and traffic characteristics of the road. A significant benefit of a comprehensive CPM program is that it gives managers control over future network conditions and funding needs. By controlling future network conditions, decision makers can anticipate routine maintenance work loads, safety deficiencies, and ride quality needs. Capital preventive maintenance lies at the heart of a sound asset management program.

Asset Management Council

Legislative History

In 1998, the Michigan Legislature established the Act 51 Transportation Funding Study Committee. This committee was charged with studying transportation funding issues and making recommendations for improving the way that Michigan's transportation providers maintain, operate, and modernize their facilities and services. As part of its work, the committee consulted with representatives from state and local transportation agencies, stakeholders in the business sector, and the transportation industry in general. It was the final report from this committee, *Transportation Funding for the 21st Century*, which initially recommended the establishment of a consistent asset management process for Michigan's transportation infrastructure.

One of the major findings of the committee was that it was impossible to assess the level of resources required to support Michigan's transportation system without consistent condition data. One of the most critical concerns raised during the committee's deliberations was that there were a myriad of methodologies being used to evaluate the condition of Michigan's roads. This was especially true when it came to the actual numbers being used to report pavement condition. The committee stressed the need for policy-makers to have one method and one method only.

Legislation was introduced in 2000 to implement many of the recommendations generated by the Act 51 Transportation Funding Study Committee, but the Legislature chose not to act at that time. During that time, the County Road Association of Michigan (CRAM) and the Michigan Department of Transportation (MDOT) entered into an agreement to conduct a pilot project to test the asset management concepts proposed by the committee. The purpose of the pilot was to develop and test guidelines for collecting, storing, reviewing, and analyzing roadway data. The objectives of the pilot were to:

- Evaluate the use of the Pavement Surface Evaluation and Rating (PASER) system for rating Michigan's roads;
- Determine the time and resources needed to conduct road condition surveys;
- Evaluate procedures for collecting road condition data;
- Evaluate the potential for the Michigan Geographic Framework to support the process; and
- Promote working relationships between agencies involved in asset management activities.

The pilot study showed that the PASER methodology could be implemented on a statewide basis by all transportation agencies for a reasonable cost per mile (less than \$18), the data could be collected and stored in the Framework which would allow for easy retrieval and mapping capabilities, and that the various agencies could work together in a spirit of cooperation rather than competition and contentiousness. Based on the success of the pilot, CRAM and MDOT jointly developed a new asset management bill for consideration by the Legislature. With support from all transportation custodians in the State, Public Act 499 of 2002 was enacted. (See Appendix A for a copy of the law.)

Act 499 outlined three key elements of asset management for the State of Michigan:

- It established the definition of asset management;
- It created the Transportation Asset Management Council under the auspices of the State Transportation Commission; and
- It defined the roles and responsibilities of the Council and the state's public road agencies.

In addition, Act 499 implied a number of guiding principles for implementing asset management on a statewide basis:

- The methods employed should be cost-effective and efficient;
- The asset management strategy and the implementation of it should be a coordinated, unified effort; and
- Wherever possible, existing resources should be used.

Michigan's Transportation Asset Management Council

To implement an asset management approach throughout Michigan, Public Act 499 of 2002 created the Transportation Asset Management Council (Council). The Council is charged with: "...advising the [state transportation] commission on a statewide asset management strategy and the processes and necessary tools needed to implement such a strategy beginning with the Federal-aid eligible highway system, and once completed, continuing on with the county road and municipal systems, in a cost-effective, efficient manner." [MCL 247.659a(2)]

The Council is comprised of 11 members, 10 of which are voting members. (For a list of current members see Appendix B.) There are two members each from the Michigan Municipal League, County Road Association of Michigan, Michigan Department of Transportation, and one each from the Michigan Transportation Planners Association (metropolitan planning organizations), Michigan Association of Regions,

Michigan Association of Counties, and the Michigan Townships Association. The non-voting member is from the Center for Geographic Information, which serves as the central repository for all of the data collected by the Council. These agencies represent the owners of the assets and those that are in some manner responsible for project selection or funding.



Members of the Asset Management Council meet for one of their monthly meetings.

MDOT is responsible for all administrative functions of the Council. The metropolitan and regional planning organizations are required to provide technical assistance to the Council. The Council is created as part of the State Transportation Commission and the Commission Advisor serves as liaison between the Commission and Council. The Commission approves the Council Members and approves the draft annual budget. Members serve 3-year terms and are eligible to be reappointed. The Council is required by law to report to the Commission and the Legislature on an annual basis regarding its activities.

Major Accomplishments

Over the last four years, the Council has made a number of very significant strides. These accomplishments include fulfilling certain recommendations of the Act 51 Transportation Funding Study

Committee, requirements of Act 499 of 2002, and basic fundamental management activities.

1. Developed a spirit of cooperation: Initially, the number one issue that the Council had to overcome was a decade of suspicion and mistrust amongst the various agencies. This barrier has been overcome largely due to the attitudes of the individual members and their willingness to set aside differences in order for the Council's efforts to succeed. This attitude has filtered down to the respective agencies represented on the Council. Competition and contentiousness has been replaced by cooperation and an understanding that the system is not 617 individual owners but an integrated network of highways, roads and bridges.

2. Established a central data repository: This was one of the major recommendations from the Act 51 Transportation Funding Study Committee. In the fall of 2003, the Council selected the Center for Geographic Information (CGI) of the Michigan Department of Information Technology to serve as its central data storage agency. The Council wanted an "honest broker" that had no other interests in the data, but rather was focused on storing it and making it available for reports. The CGI is responsible for storing and maintaining the data collected by the Council. The CGI maintains the Michigan Geographic Framework which is a single, statewide geographic information system (GIS) base map and the Asset Investment Reporting System used by local agencies to report on their annual projects and investments, as required in the law. The Council now has 4 years of PASER data on the federal-aid system (covering 47,000 miles), 4 years of National Bridge Inventory data, and 2 partial years of projects and investment data. It is in the process of beginning to collect PASER data on local roads.

3. Established a uniform condition rating scale: This was also one of the major concerns expressed by the Act 51 Transportation Funding Study Committee. The Council chose to use the Pavement Surface Evaluation and Rating (PASER) method for determining the condition of Michigan's roads and the National Bridge Inventory for bridges.

4. Established working relationships with MPO/RPOs: The law requires that the metropolitan and regional planning organizations provide "technical" assistance to the Council. However, the law does not define what "technical" means. Working in cooperation with the MPOs and RPOs, "technical" has been defined to include coordinating the data collection efforts within their respective regions, analyzing and publishing information on the condition of the roads in their areas, and coordinating training activities in their areas.

5. Developed processes needed to implement asset management:

The law requires the Council to develop the “processes...needed to implement [an asset management] strategy” on a statewide basis. To date the Council has defined the steps involved in an asset management process; published a brochure and a guide that can be used by local agencies to set up an asset management program; and conducted numerous training activities throughout the state.

6. Developed various tools that can be used to implement asset management:

The law also requires that the Council recommend the “necessary tools” to implement an asset management strategy. The Council has selected RoadSoft (a management system developed by Michigan’s Local Technical Assistance Program) as a tool that local agencies can use to implement the various aspects of an asset management program. The Council supports the development of the strategic analysis portion of the software and assists in training local agencies on how to use the tool. The Council itself uses the Bridge Condition Forecasting System and Pavement Condition Forecasting System for the present.

7. Established sound management principles for on-going operations:

During the first four years of its existence the Council has concentrated on laying a proper foundation for future achievements. This has included establishing guidelines and procedures for collecting the appropriate data needed to properly analyze the condition of the system, adopting a Mission Statement, establishing goals and objectives, and developing a 3-year work program.

Now the Council is moving into an implementation phase. In order to fulfill its statutory obligations, the Council is concentrating its work in the following three critical areas:

1. **Education and Training:** Developing and promoting asset management training materials and conducting/sponsoring training aimed at road agencies throughout Michigan.
2. **Data Collection:** Establishing procedures for collecting pavement and bridge condition data, reporting investment data, and compiling information for statewide reports.
3. **Strategic Analysis:** Assessing the data that has been collected and projecting future road and bridge condition based upon current condition and various funding levels.

The remaining chapters of this report describe these areas in more detail.

2007 Activities

The Council is required by law, to report to the State Transportation Commission and Legislature on the activities that it expects to conduct during the current year. In the past, we have listed specific activities which we intended to undertake. These included data collection, training, pilot projects and evaluation of the current and future road and bridge condition. Given the current state budget situation and in light of the Governor's recent Executive Directives, the Council will only undertake those activities which are necessary to fulfill its legal mandate as enumerated in MCL 247.659a. As such, the Council is suspending its pilot project program and reducing the number of meetings it will be holding during the remainder of 2007. If and when such restrictions are lifted we will review activities to determine their effectiveness in fulfilling the Council's mission.

Education & Training

“One of the most fundamental and critical aspects in expanding preventive maintenance efforts is the role of educating others of the impacts and implications of this asset management system. Not only does educating others draw attention to the need for preventive maintenance in an asset management system but it also informs others of the long-term benefits to be realized from preventive maintenance efforts.” (Eger, et al., *Capital Preventive Maintenance*, Project 03-01, Midwest Regional University Transportation Center, February 2004, p. 7)

Countries around the world that have implemented successful asset management programs found that until they began providing teaching materials to local agencies asset management was nothing more than an interesting theory. Once they began to distribute educational materials and trained agency personnel in how to do asset management they saw a difference in the overall condition of their systems. Based upon these agencies experiences the Asset Management Council has embarked on an aggressive educational and training program.

During the last four years the Council has:

- Produced a training manual entitled *Asset Management Guide for Local Agencies in Michigan*;
- Hosted 8 to 10 training session on the PASER rating method each year;
- Held nearly 20 training sessions on the Asset Investment Reporting System;
- Hosted three in-depth asset management courses and have three more scheduled for 2007;
- Sponsored four pavement preservation classes conducted by the National Center for Pavement Preservation;
- Made 55 presentations on asset management at various meeting and conferences;
- Hosted the first Michigan Asset Management Conference which was attended by over 250 individuals;

All told over 1,000 individuals have received training in asset management over the last four years. These individuals represent 240 agencies including 114 cities and villages, all 83 county road commissions, all MPOs and regional planning organizations, and MDOT. **The Council intends to continue its emphasis on education and training throughout 2007.**



Attendees at the 2006 Asset Management Conference held at Michigan State University

The Council's education and training activities are a cooperative effort involving the MPOs and regional planning organizations, the Michigan Local Technical Assistance Program (LTAP) at Michigan Technological University and the National Center for Pavement Preservation at Michigan State University. The extent of the training covers basic asset management principles, PASER condition ratings, and in-depth training on pavement preservation.

PASER Training: The PASER training is conducted on an annual basis by the staff of the Michigan LTAP. This is a one day course that teaches participants how to rate the condition of a road's pavement using the PASER rating method. Attendees learn what defects to look for in each of 10 rating categories.

Asset Investment Reporting: The Center for Geographic Information conducts annual training classes on how to enter investment data into the Council's Asset Investment Reporting System. They have also developed an on-line User's Guide.

Asset Management Training: The Michigan LTAP conducts a number of classes on asset management on behalf of the Council. They have a

half day course that is aimed at elected officials and upper management decision makers. This course covers the basics of asset management and why it makes sense from a financial and long-range planning aspect. The second course is a day-long session and is tied to the information in the Council's *Asset Management Guide for Local Agencies in Michigan*. Attendees learn what goes into an asset management plan and how to develop one for their individual agencies.

Pavement Preservation: The National Center for Pavement Preservation conducts a two-day course entitled "Pavement Preservation: Applied Asset Management." Participants learn the basics of what causes pavements to deteriorate, how to do trade-off analysis, and how to put together a capital preventive maintenance program using a variety of fixes that extends the useful service life of a network.

Michigan Asset Management Conference: Last year the Council hosted the first annual Asset Management Conference. Attendees heard presentations from Council Members and practitioners of asset management from around Michigan and the United States. This year the Council is hosting a conference, in April at Michigan State University.



Tim Colling from the Michigan LTAP office discusses the importance of pavement management at last year's conference.

Growth in Asset Management in Michigan

One of the major barriers to implementing asset management in the beginning was getting buy in from local agencies. There are 617 agencies responsible for roads and bridges under Act 51. Getting everyone on the same page has been difficult. But we have seen a significant change during the last four years. For example, in 2003 the Council conducted a survey of all cities and counties. We were interested in finding out how many were actually using some type of pavement management system. We had 224 agencies respond (a 36% response). Of that total only 99 said they were using a pavement management system and of that total 66 were using RoadSoft. Today over 230 agencies have RoadSoft.

In addition, in 2006 the Legislature passed Act 338 which allows cities and villages greater flexibility in how they use their Act 51 revenues if they have adopted and are implementing an asset management plan. The law restricts cities and villages from spending more than 50% of their Act 51 revenues on their local streets. However, if they have an asset management plan in place they can spend whatever amount they like on their local streets. While only 9 cities currently have approved plans another two dozen are in the process of developing them. So this change in the law has sparked interest from cities and villages in asset management.

Strategy Recommendation

Act 499 of 2002 requires the Council to advise the State Transportation Commission “on a statewide asset management strategy and the processes and necessary tools needed to implement such a strategy...”

A strategy can contain a number of different elements to it including condition goals, training, etc. **Consequently, the Council is recommending that part of that strategy be an on-going comprehensive educational and training program that provides local and state agencies with the information needed for them to develop and implement their own asset management programs.**

Condition of the System: 2006

One of the most critical concerns raised during the Act 51 Transportation Funding Study Committee's deliberations was that there were a myriad of methods being used to describe the condition of our roads. For instance, the International Roughness Index (IRI) measures roughness. This is what is reported in the TRIP report each year. There is Remaining Service Life (RSL) which is used by several agencies including MDOT. There is a pavement condition index or PCI. Both RSL and PCI combine elements of surface distress and structural capacity. And there is PASER, a surface condition analysis used by most of the road agencies throughout Michigan. And while the tendency is to compare these different methods, the truth is they do not measure the same conditions and should not be compared. The Act 51 Transportation Funding Study Committee stressed the need for policy makers to have one method and one method only that they could rely on.

The Council chose the **Pavement Surface Evaluation and Rating System** (PASER) because the data it uses is easy to collect; it is of sufficient detail for statewide, network-level analysis; and it is the method currently used by most road agencies in Michigan. PASER is the rating method used by RoadSoft, which is the predominant pavement management software in use throughout Michigan.

PASER

PASER is a visual survey of the condition of the surface of the road. It rates the condition of various types of pavement distress on a scale of 1-10. It is based on a system of pavement evaluation developed in Wisconsin and is used by most road agencies in that state. This type of survey is one of the easiest to do and is relatively inexpensive compared to other rating methods. This makes it ideal for small agencies.

The Transportation Information Center, University of Wisconsin-Madison has published a series of manuals associated with ratings for different types of surfaces. The manuals are "designed to provide background information on asphalt pavement conditions and causes of distress as well as a simple procedure to rate pavement condition." (*Asphalt – PASER Manual*, Transportation Information Center, University of Wisconsin-Madison, November 1996) There are also manuals for concrete, gravel, brick, etc.

While PASER is a subjective method it is based on sound engineering principles. PASER measures "surface distress." It does not measure structural capacity, ride quality or friction.

PASER uses 10 separate ratings. The Council groups the 10 ratings into three categories based upon the type of work that is required for each rating. These categories are routine maintenance, capital preventive maintenance, and structural improvements. There are different ratings for different surfaces based on the types of deterioration that is evident.

Routine Maintenance

Routine maintenance is the day-to-day, regularly-scheduled activities to prevent water from seeping into the surface such as street sweeping, drainage clearing, gravel shoulder grading, and sealing cracks. PASER ratings 8, 9, and 10 are included in this category. This category also includes roads that are newly constructed or recently seal coated. They require little or no maintenance. In popular nomenclature **these roads are considered “good.”** (For examples of roads in this category see the pictures in Appendix D.)

Capital Preventive Maintenance

Capital preventive maintenance (CPM) is a planned set of cost effective treatments to an existing roadway that retards further deterioration and maintains or improves the functional condition of the system without significantly increasing the structural capacity. The purpose of CPM fixes is to protect the pavement structure; slow the rate of deterioration; and/or correct pavement surface deficiencies. PASER ratings 5, 6, and 7 are included in this category. Roads in this category still show good structural support but the surface is starting to deteriorate. CPM is intended to address pavement problems **before** the structural integrity of the pavement has been severely impacted. **These roads are considered “fair.”** (For examples of roads in this category see the pictures in Appendix D.)

Structural Improvements

Roads with a PASER rating of 1, 2, 3, or 4 are in need of some type of structural improvement such as resurfacing or major reconstruction. Alligator cracking is evident. Rutting is beginning to take place. Once you get rutting on a road the underlying structure is beginning to fail and it must be either rehabilitated with a fix like a crush and shape or it must be totally reconstructed. The ironic thing about a road in this condition is that in the early stages of rutting the ride might be very smooth and you wouldn't consider it to be a road in poor condition. However, the “window of opportunity” has been shut! **These roads are considered “poor.”** The following series of pictures shows a number of roads that are rated as 4 or less.



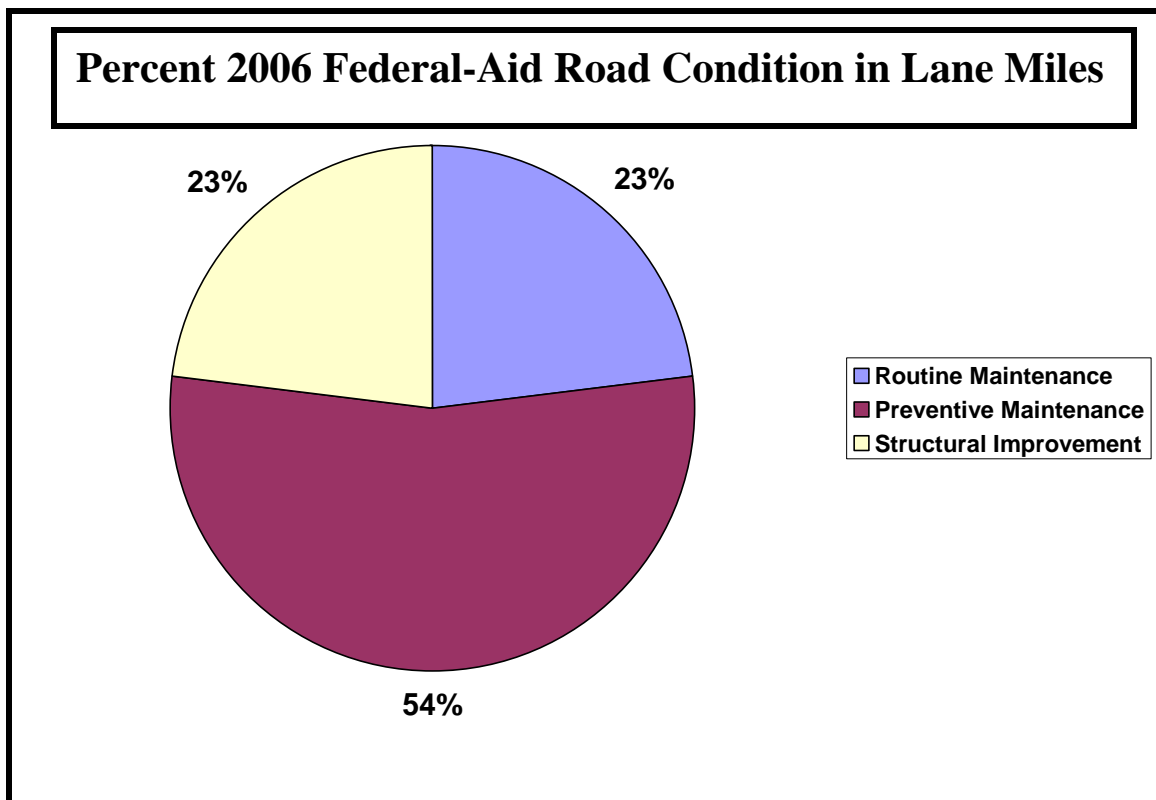
2006 Road Condition

During the months of July through November, over 100 teams of trained raters drove some 54,500 miles in order to assess the condition of the state's 43,000 miles of federal-aid eligible roads. The collection of roadway condition data by the Council is a cooperative effort involving teams of county, city, state, and regional planning staff members. Individuals must take a training course before being allowed to rate the roads. This effort was coordinated by the 21 regional planning and metropolitan planning organizations.

The data is reported in lane miles. A lane mile is determined by multiplying the number of lanes by the length of the road. For example, if you were surveying 5 miles of a 2 lane road you would be rating 10 lane miles. If it were a 4 lane road then you would have 20 lane miles.

So while we had 43,000 route miles this translated into nearly 93,000 lane miles.

Overall there were nearly 21,828 lane miles needing routine maintenance; 49,777 lane miles needing capital preventive maintenance; and 21,222 lane miles needing structural improvement. For a breakdown of condition by functional classification see table in Appendix C.



Source: TAMC 2006 Data File, Center for Geographic Information

One of the most significant observations we have noticed over the last three years of data collection is the dramatic increase in the number of **lane miles needing structural improvement** (rehabilitations and reconstructions). These are roads in “poor” condition. In 2004, 11,499 lane miles were identified as needing structural improvement. By 2006, that number had nearly doubled to 21,222 lane miles; **an 85% increase.** In 2004, nearly 88% of the federal-aid system could be considered in good or fair shape. By 2006, that figure had fallen to 77%. Some of this can be attributed to better training methods; however, a change of this magnitude cannot be attributed solely to improved raters. **Clearly, the overall condition of the federal-aid system is getting significantly worse with as many miles in poor condition as in good condition!**

2006 Bridge Condition

Bridges can be classified as “structurally deficient” or “functionally obsolete.” These classifications are determined by the National Bridge Inventory database (NBI). A ***structurally deficient*** bridge is one in which at least one of the major structural elements (deck, superstructure, or substructure) has a condition rating of poor or worse. **A structurally deficient bridge is not a bridge that is unsafe to drive on or under.** A ***functionally obsolete*** bridge is one that is not structurally deficient, but has deficient roadway width, vertical clearance, waterway, road alignment or load capacity.

Federal law requires that bridges be inspected at least once every two years. There are 9 different categories which determine whether a bridge is classified as “deficient.” Condition ratings are based on a 0-9 scale and assigned for the superstructure, the substructure, and the deck of each bridge. A condition of 4 or less classifies the bridge as being “deficient.”

Structurally Deficient: Generally, a bridge is structurally deficient if any major component is in “poor” condition. If any one or more of the following are true, then the bridge is structurally deficient.

- Deck Rating is less than 5
- Superstructure Rating is less than 5
- Substructure Rating is less than 5
- Culvert Rating is less than 5
- Structural Evaluation is less than 3

Functionally Obsolete: Generally, a bridge is functionally obsolete if it is NOT structurally deficient AND its clearances are significantly below current design standards for the volume of traffic being carried on or under the bridge. More specifically, if the bridge is NOT structurally deficient AND any one or more of the following are true, then the bridge is functionally obsolete.

- Structural Evaluation = 3
- Deck Geometry is less than 4
- Underclearance is less than 4 and there is another highway under the bridge
- Waterway Adequacy = 3
- Approach Roadway Alignment is less than 4
- Waterway Adequacy is less than 3

A bridge cannot be classified as both structurally deficient and functionally obsolete. If a bridge qualifies for both, then it is reported as structurally deficient. While functionally obsolete bridges represent

needed improvements if the overall system is to achieve maximum operating efficiency, the bridges rated as structurally deficient require more immediate attention.



The following table shows the bridge condition on the federal-aid system (minus local roads) for the last four years.

ARTERIALS	2003	2004	2005	2006
STRUCTURALLY DEFICIENT	680	664	502	636
Percent	9%	9%	8%	9%
FUNCTIONALLY OBSOLETE	603	598	368	591
Percent	8%	8%	6%	9%
GOOD CONDITION	2866	2871	2517	2947
Percent	40%	40%	39%	44%
COLLECTORS				
STRUCTURALLY DEFICIENT	421	447	452	379
Percent	6%	6%	7%	6%
FUNCTIONALLY OBSOLETE	367	374	355	317
Percent	5%	5%	5%	5%
GOOD CONDITION	2292	2232	2275	1844
Percent	32%	31%	35%	27%
TOTALS	7229	7186	6469	6714

Source: National Bridge Inventory, MDOT

As can be seen from the data in the table the overall number of bridges on the arterial system in good condition has improved slightly since 2003 while the overall number of the bridges on the collector system in good condition has declined. It should be noted that the total numbers change from one year to the next because the system is always in a state of flux. Some bridges are closed. Others are opened. Some bridges don't get inspected one year and then are the next. So we would expect to see some variations in the total numbers from year to year.



Local Roads and Streets

In addition to the federal-aid roads there are some 80,000 miles of local roads and streets in Michigan. Act 499 stipulates that the Council is to concentrate its efforts first on the federal-aid system and once that is completed then begin doing the same process on local roads and streets. In 2005 and 2006, the Council decided to begin collecting data on a sample of local roads. The intent was to determine how long it would take to collect this data and how much was it going to cost. To date we have collected data on 9,475 miles or about 11% of the local system. Raters can average about 5 miles per hour at a cost of \$11.65 per mile. We have not yet begun to analyze the ratings.

Investments in the System

Michigan's public highways and bridges, collectively, represent the single largest publicly-owned asset. While accurate figures for all roads and bridges are not readily available, consider that the state government of Michigan owns some \$19 billion in assets of which MDOT owns \$15.1 billion or 79% of all assets owned by the State. Of that \$15.1 billion, \$12.1 billion is in roads and bridges. If you consider MDOT owns only 8% of the total mileage of public roads, the total value of all roads is significantly higher. Consequently, **the public roads and bridges in Michigan constitute a valuable public asset.**

Asset Investment Reporting System

MCL 247.659a(9) states the "department and each local road agency shall keep accurate and uniform records on all road and bridge work performed and the funds expended for the purposes of this section, **according to the procedures developed by the Council.** Each local road agency and the department shall annually report to the Council...the receipts and disbursements of road and street funds in the manner prescribed by the Council..." [Emphasis added.] During 2005, the Council developed an Internet-based reporting process for agencies to use in submitting the required information.

The Michigan Center for Geographic Information (CGI) has developed an Internet-based reporting tool to support the statewide transportation asset management process. The tool is designed for road agencies to submit information on the work they have done during 2005 and planned activities for 2006, 2007, and 2008.

The tool allows any road agency to securely login to the application to enter information for their respective jurisdiction. If an agency does not have Internet access, authority can be given to another entity (for example, a regional planning organization), to input and maintain the information for that jurisdiction.

The importance of this tool is that it gives all local and county road agencies with an Internet connection a way to begin collecting this information without much technical or financial commitment. This information is a critical part of the transportation asset management process. It will be used in conjunction with the PASER road rating information to better enable effective asset management at the jurisdiction and statewide levels.

In 2006, the Council held thirteen training sessions around the state during the months of March and April to instruct local agencies on the use of the investment tool. Information on work that was done during 2005 had to be reported by June 1, 2006. Initial compliance was somewhat disappointing. Only 269 out of 617 agencies or 43.6% were in compliance with the law; that is they had registered AND reported investment data for 2005. Another 173 agencies or 28% had registered but had not reported any data as required by the law. Finally, 175 agencies or 28.4% were in non-compliance. They had not reported nor even registered. The Council has made modifications to the investment tool and conducted additional training with the intent of getting better compliance in the future.

2005 Investments

The information in the reporting tool, as a whole, is insufficient for analyzing the investments made within the last couple of years. Consequently, the Council has chosen to report on information submitted through the Act 51 financial reports that each city and county are required by law to file with MDOT. In addition, MDOT data was obtained from the department's MAP database. The data reported is for the fiscal year ending September 30, 2005, which is the most recent year data is available.

In 2005, investments in the system totaled \$2.829 billion. The investments were broken down into the following categories:

Routine Maintenance (including Winter Maintenance):	\$ 553,669,871
Capital Preventive Maintenance:	1,019,725,787
Structural Improvement (rehab & reconstruct):	938,394,803
Bridges & Structures	210,915,492
Traffic, Safety & Other Construction*:	106,433,999
Total	\$2,829,139,952

*Other construction can include city share of trunk line or county road work, roadside parks, or special assessments.

Impact on Buying Power

Of this total \$2.829 billion, \$1.958 billion was directly attributable to improving the condition of our roads. By this we mean that work in the capital preventive maintenance and structural improvement categories contributes to the change in condition of the roads. If we continued to invest at that same level each year for the next 10 years, we would expect to invest nearly \$20 billion. However, inflation alone (at 4%) will eat into that total so that the actual buying power would amount to \$16.5 billion.

If we take out initial investments from bonding (which in later years become expenses) the total drops to just over \$14.1 billion. This level of investment could be further eroded by rising gas prices, fewer miles being traveled, and increasing fuel efficiency, all of which would affect the revenues coming into the Michigan Transportation Fund (MTF) and consequently affect contributions from the MTF to road agencies.

Impact on Agencies: Trade-offs

Every agency, in times when revenues are tight, is forced to make trade-offs; how much should we spend on one type of work as compared to another? Examples of the types of trade-offs agencies are forced to make include:

- **Routine Maintenance versus Capital Preventive Maintenance or Structural Improvement:** Not only does the inflationary erosion of funds affect the CPM and structural improvement work that can be done it also affects routine maintenance activities such as repairing pot holes or removing snow. And these are activities that must be done for safety and liability reasons. When a larger portion of funds must go to routine maintenance activities it reduces the amount that can be used for other types of fixes that improve the overall condition of the system. And with a year like we have had with large snowfalls into April, an agency's planned construction budget can be wiped out for an entire year.
- **Preservation versus Capacity & Traffic Operations:** This trade-off addresses the amount of money allocated to preserving the existing system versus the amount allocated to improving traffic conditions and addressing the growing problems with congestion.
- **Transportation Work or Other Community Services:** For most communities in the state the funds they receive from Act 51 disbursements are insufficient to pay for their overall street needs. In fact, 60% of the agencies annually get \$200,000 or less from Act 51. It costs, on average, \$150,000 to do a single mile of crush and shape, which is a fix used by many local agencies. Consequently, to keep up with deterioration, many communities are faced with supplementing their Act 51 funds with General Fund monies or special assessments. In these times of severe budget strains on local governments, this can put street repairs in competition with police and fire or other local services.

Economic Value of Investments

What is the value of this level of investment to the people of Michigan? In the first place there is the value of **reduced travel costs**. The

National Center for Pavement Preservation notes: “Pavement condition affects travel cost including vehicle operation, delay and crash expenses. Poor road surfaces cause additional wear or even damage to vehicle suspensions, wheels, and tires.” (*Pavement Preservation: Applied Asset Management*, National Center for Pavement Preservation, Department of Civil and Environmental Engineering, MSU, November 2006, p. 1-3, 1-4)



Second, there is the **economic value in the form of jobs**. If we assume the same ratio of jobs generated per dollar of investment that came out of the REMI analysis reported by MDOT in their *Five-Year Transportation Program*, then the \$2.829 billion investment in 2005 generated 47,653 jobs.



Projected Condition of the System

A key element of any asset management process is the ability to project future conditions based upon alternative scenarios. The future condition of the system depends on how much an agency is able to invest in capital preventive maintenance and structural improvement (rehabilitation and reconstruction). Typically, the work required to achieve an idealized condition costs far more than agencies can afford to pay. However, deferred maintenance can be costly because as facilities age they tend to deteriorate more rapidly. Agencies that are not able to make sufficient investments to maintain or improve conditions face a higher price tag in the future, as well as potentially unacceptable levels of service for road users. Therefore, it is important for agencies to consider a **Mix of Fixes** approach: **the right fix in the right place at the right time.** Also, it is important to develop the capability to understand the relationship between repair strategies, funding levels and condition. Computerized models have been developed that allow agencies to consider a number of alternatives before deciding on which one is the best approach for their system.

During 2006, the Asset Management Council tested three such models:

- RoadSoft
- Pavement Condition Forecasting System
- Bridge Condition Forecasting System

RoadSoft

In December of 2005, the Council chose RoadSoft for use in developing its statewide strategy. RoadSoft is an attractive option for many local agencies in Michigan. This system is funded through the Federal Highway Administration and MDOT and distributed by Michigan Tech at no cost to Michigan agencies. RoadSoft uses PASER data and has an active user community that meets several times a year to discuss functionality and future development direction.

This management system has been distributed to over 230 local agencies. It allows an agency to systematically manage their infrastructure including pavements, culverts, signs, pavement markings, guardrails, curb and gutter, and accident location information. “The deterioration and strategy evaluation capabilities allow agencies to model road surface deterioration and build complex repair strategies (mix of fixes), predict future network performance, and optimize between needs, expectations and revenues.” *(Draft: Validation of the Pavement Performance Models Used In Michigan’s RoadSoft GIS Integrated*

Infrastructure Management System,” Dr. Jianping Dong, Michigan Tech, January 2007, p. 3.)

In 2006, the Council contracted with Michigan Tech to do a study that examined the validity and confidence of the two growth models currently used for deterioration and strategy analysis in RoadSoft. The study found a couple of areas where the model could be improved and those changes were successfully incorporated into the model.

RoadSoft is based on a logistic growth model that is very data intensive. To date this data has been difficult to obtain on a statewide basis. While the Council has the necessary data for the state trunk line system it does not have comparable data from all local agencies.

Because of the lack of data on the local systems, the Council initiated a number of runs using the state trunk line system as the test case. Based on the runs undertaken to date, RoadSoft seems to work well so long as sufficient data is available. The Council will continue to urge local agencies to use RoadSoft and will continue to provide training in how to use the model to its maximum capabilities. Further the Council will work with local agencies to get the data necessary to run RoadSoft on a statewide basis. In the meantime, the Council will be using the Pavement Condition Forecasting System to predict future condition on the federal-aid system.

Pavement Condition Forecasting System

The Pavement Condition Forecasting System (PCFS) is an adaptation of MDOT's Bridge Condition Forecasting System. It is a spreadsheet application that uses transition probabilities to predict future condition. Basically, this approach says: what is the probability of an asset (such as a section of pavement) moving from one condition state to a different condition state over time. Assuming a group of roads with a particular PASER condition state and two years of condition observations, then how many segments that were rated 9 in 2004 remained a 9 in 2005; how many went to 8s; how many went to 7s, etc.? Through this observation you can calculate a transition probability matrix. MDOT has used this approach for bridges during the last decade and found it very effective for predicting future bridge condition. The assumptions used in the run were as follows:

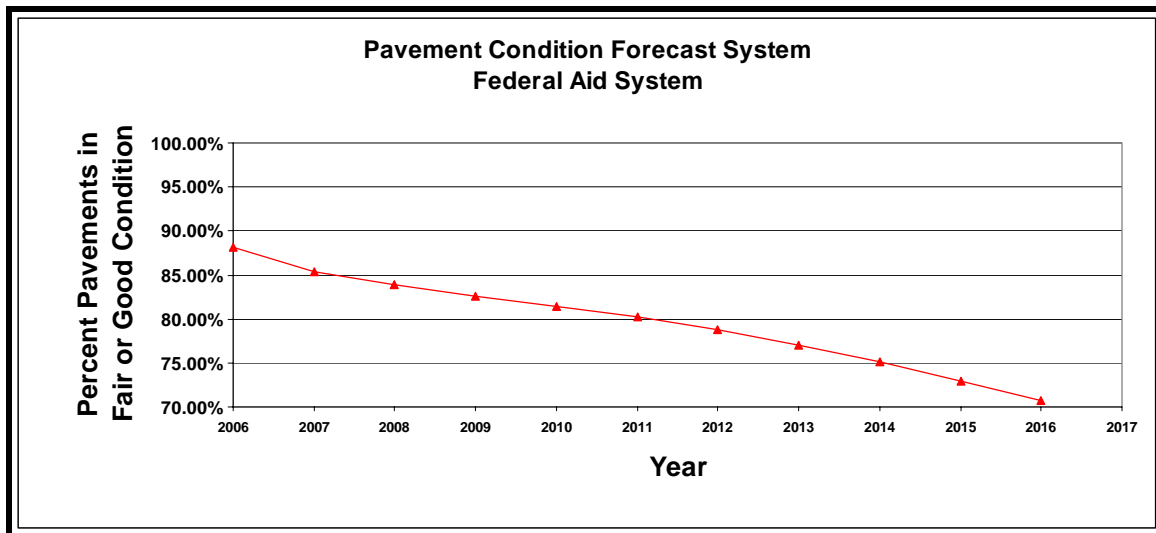
- 2004 and 2005 PASER ratings;
- Categories are Capital Preventive Maintenance and Structural Improvement with Structural Improvement being divided into rehabilitation and reconstruction;

- Beginning dollar amount of \$1.958 billion which was the actual amount reported for these categories in 2005; this amount is continued for 2006 and 2007; beginning in 2008 the amount is reduced each year by \$363 million;
- Costs per lane mile are:
 CPM: \$55,000
 Structural/Rehabilitation: \$405,000
 Structural/Reconstruction: \$1,271,000
- Split between CPM and Structural Improvement is:
 CPM: 52%
 Structural: 48% with Rehabilitation at 24% and Reconstruction at 24%. This represents the actual split between the categories in 2005; and
- A 4% inflation rate which is the same rate used by MDOT in their Call for Projects.

Projected Condition

The following graph shows the projected condition of the federal-aid system based upon the above assumptions. The graph shows the percent of lane miles in either good or fair condition. This reflects pavements that are rated between 5 and 10 on the PASER scale.

Looking at the graph, with the effect of inflation and the reduced level of funds, the condition of the system declines to just over 70% good or fair by 2015. The value of the dollar in 2015 will only provide \$1.12 billion for road repairs.



If we look even closer at the impact on need and miles of work that can be accomplished **this scenario presents a very discouraging forecast for the future.**

In 2005, just over 17,000 lane miles were improved, that is their PASER rating increased from the previous year. By 2015, the projected total number of lane miles that can be improved drops below 11,500 or a decrease of over 5,500 miles. With regards to the number of miles needing rehabilitation or reconstruction, by 2015, there will be some 22,731 lane miles in this category. However, **we will only be able to repair 876 lane miles with the available funds!**

But the actual situation is worse than the projection because, in reality, we are already at that level of need. As noted in the section on "Condition" **we currently have 21,222 lane miles needing rehabilitation and reconstruction, nearly as much as the 22,731 lane miles projected for that type of work in 2015.**

Predictive models have two main inputs, condition data and investment data. As was noted in the section on "Investments" we do not currently have data for the amount of money invested for 2006. With just 2006 condition data available we have not been able to run the models with the new pavement ratings reflected. Once the 2006 investments become available we will rerun the model and report the results to the State Transportation Commission and Legislature.

Bridge Condition Forecasting System

Working from current bridge condition information (National Bridge Inventory data), bridge deterioration rate, project costs, expected inflation, and fix strategies, the Bridge Condition Forecasting System (BCFS) estimates future condition of trunk line and local bridges. The system uses transition probabilities to determine the future condition of a bridge. We made two separate runs; one for trunk line bridges and one for local bridges. Unlike the combined federal-aid run for roads where both trunk line and local jurisdiction roads were run together, bridges were separated because they are governed differently.

Local Bridge Program

Local bridges, those owned by cities, villages, and county road commissions, are governed by the provisions of Michigan's local bridge program. This program was created by state legislation in 2004. The goal of the legislation is to help local agencies analyze bridge projects. The legislation outlines a process for allocating Local Bridge Funds and

describes the responsibilities of the Local Bridge Advisory Board (LBAB) and the seven Regional Bridge Councils (RBC).

The LBAB is an eight member board that is responsible for the oversight of the Local Bridge Program. The board consists of three members representing counties, three members representing cities and villages, and two members from MDOT. The MDOT members are non-voting members who supply technical information and administrative support to the board. The board's responsibilities include:

- Responding to emergency situations involving local bridges;
- Allocating funds to the regions; and
- Ensuring that the RBCs are following established guidelines.

The purpose of the RBCs is to develop a three-year bridge program for maintaining and rehabilitating the bridges in their regions. The seven RBCs each represent a region of the state. Each RBC is comprised of five members: two representing counties in the region, two representatives from cities and villages in the region, and one member from MDOT's local agency bridge staff. The primary responsibilities of the RBC are to:

- Rate the applications for local bridge funds;
- Work together to create a three-year bridge plan of projects for their region; and
- Oversee the progress being made toward bringing the planned projects to contract.

Assumptions used in the projections include:

- Categories are preventive maintenance, rehabilitation, and replacement
- Beginning dollar amount of \$156 million for trunk line bridges (same amount used in MDOT's *Five-Year Transportation Program*) and \$54 million for local bridges (the amount in the local bridge program for the next several years);
- Costs per square foot of deck area for trunk line bridges are
 - Preventive Maintenance: \$32.32
 - Rehabilitation: \$64.64
 - Replacement: \$193.91
- Costs per square foot of deck area for local bridges are
 - Preventive Maintenance: \$66
 - Rehabilitation: \$132
 - Replacement: \$280
- Split between categories is
 - Preventive Maintenance: 18% trunk line; 0% local

Rehabilitation: 30% trunk line; 15% local

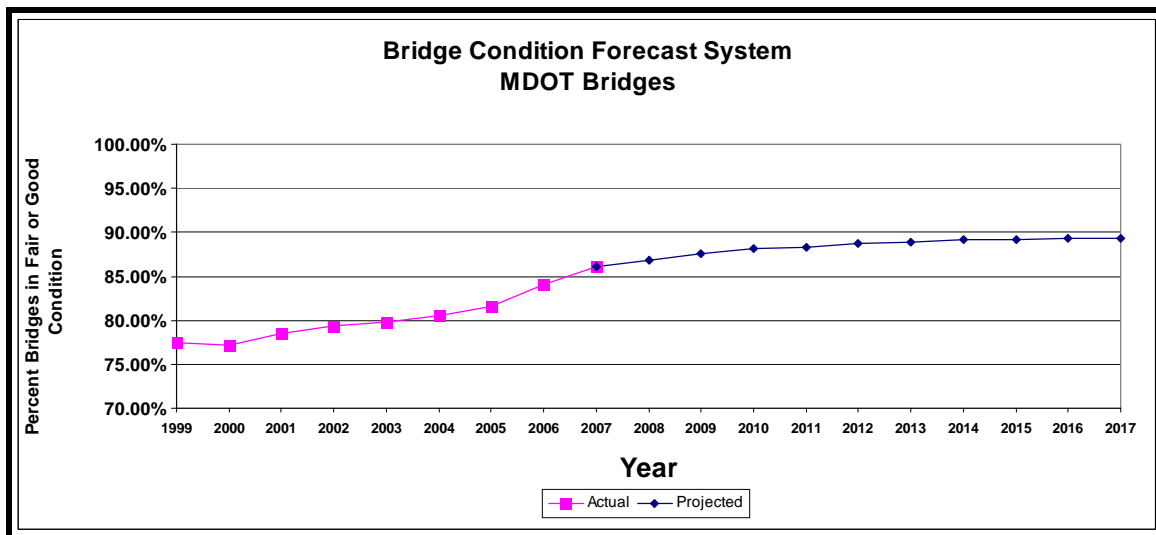
Replacement: 52% trunk line; 85% local

- There is no increase in funding levels. This is based upon assumptions from the House and Senate Fiscal Agencies regarding the MTF over the next several years; and
- A 4% inflation rate.

The following graphs show the projected condition of the state and local bridges based upon the above assumptions.

State Trunk Line Bridges

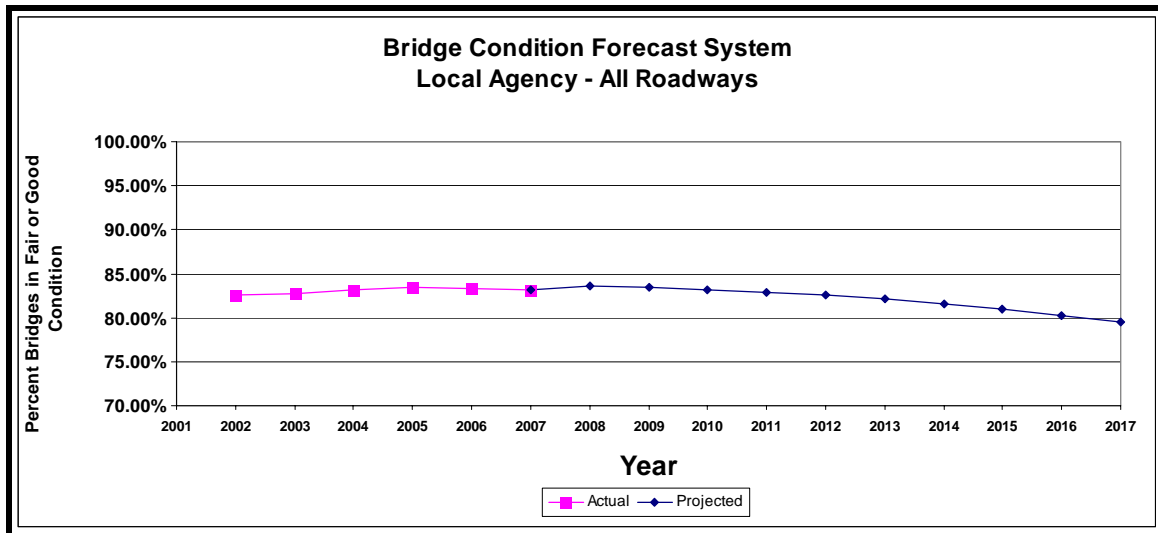
As can be seen in the following graph the condition of the state trunk line bridges is expected to improve over the next 10 years. In 2006, 84% of the bridges were rated in fair or good condition. By 2016 that figure is expected to increase to 89.9%. In 2002, the federal government approved the use of funds from the Highway Bridge Replacement and Rehabilitation Program for capital preventive maintenance work. This change in federal regulations helped MDOT in improving its overall bridge condition.



Local Bridges

Unlike the state trunk line bridges, local bridges are expected to decline. In 2006, 83% of the bridges were rated as good or fair. By 2016 this number is projected to be 80%. Part of the reason for the differences between the State-owned bridges and local bridges is that MDOT has an aggressive preventive maintenance program (18% of its total budget) while most local agencies are not able to put much money toward on-

going capital preventive maintenance. This would include such activities as sealing decks to prevent water from getting through to the substructure of the bridge. If local agencies were able to spend bridge money on capital preventive maintenance we would expect to see a general increase in the condition of their bridges over time.



Strategy Recommendation: Local Bridges

It is the recommendation of the Transportation Asset Management Council that local agencies be encouraged to implement capital preventive maintenance activities for the bridges under their jurisdiction.

Success Stories

While asset management is a new concept, a number of agencies by using the principles of asset management, have been successful in extending the service life of existing roads and bridges, meeting network level goals and objectives, and supplementing Act 51 funds with millages and special assessments. Agencies such as the Kent County Road Commission, the Cass County Road Commission, the cities of Marquette and Ionia, and MDOT have demonstrated that using asset management principles can be a beneficial approach to the overall management of their assets.

The majority of public roads in Michigan are under the jurisdiction of local governments. **If the benefits of asset management are to be realized statewide, then it is imperative that the tools and procedures of asset management be utilized by local road agencies.** Consequently, it is the intent of the Council to highlight agencies that are utilizing the principles of asset management in order to encourage other agencies to employ such methods. Each of these case studies highlights major components and benefits of employing asset management principles to the overall management of an agency's infrastructure.

City of Three Rivers

The City of Three Rivers, like most communities in the state, is subjected to repeated freeze/thaw cycles during the winter. This leads to rapid heaving and resulting deterioration of its streets and sidewalks. Prior to 1994, the City followed a "worst-first" policy, repairing streets and sidewalks when citizens complained. These projects usually imposed assessments of 25 to 100% depending on the specific situation. This strategy led to a scattering of good pavement and sidewalk amidst a patchwork of repairs throughout town.

In 2002, the City Manager asked the Engineering Department to develop a plan that would address the improvement needs of 13.5 miles of major streets, 31 miles of local streets and 80 miles of sidewalks. The City Finance Director noted that a 15-year bond issue was coming to an end and that the City might be able to convince the voters on a millage renewal in support of street and sidewalk improvement.

The City Manager, Finance Director, and City Engineer made presentations at public meetings, public hearings and to civic organizations. Guidelines were drafted on how to deal with outstanding special assessments and a four-person advisory committee was proposed

to oversee the improvement program. Based upon these efforts, the millage renewal was approved.

Since 2003, the City has adopted a mix of fixes approach to maintain, upgrade, and replace streets. Several miles of streets have been rebuilt and many miles have been upgraded. Nearly 25 miles of sidewalks have been improved to Americans with Disabilities Act standards. Additionally, this process has gained the City Administration a great deal of credibility with its citizens.

Calhoun County Road Commission

The Calhoun County Road Commission (CCRC) has been using a PASER based asset management system since 1994. Besides the road quality module, the CCRC uses the sign, crash, and culvert modules of the RoadSoft program to provide basic asset management tasks. As well as the basic functions available from RoadSoft, the CCRC does advanced analysis using GIS tools that provide spatial analysis and sophisticated statistical analysis.

These tools provide advanced mapping and analytical powers that allow the CCRC to broaden the search for relationships between road assets and many socio, economic and environmental factors. The ability to explain asset conditions and safety problems with a broad range of factors means there is a greater likelihood of relating needs and problems to a wider audience of the public.



City of Romulus

The City of Romulus began working on a pavement asset management plan in September of 2005. The City collected condition data and designed a capital preventive maintenance program that will extend the service life of the City road network. This plan was adopted by the City Council. The plan states: "The City of Romulus owns and maintains approximately 105 miles of roadway. Of this, 55 miles are asphalt, 43 miles are concrete, and 7 miles are gravel...An organized and balanced approach to pavement maintenance is imperative to realizing the maximum service life of the road network. Often, a 'worst-first' methodology is adopted, spending much of a road budget on a full reconstruction of the pavements in worst condition. The more balanced approach includes the maintenance of pavements in fair or good condition. This maximizes the overall service life of the street network and protects the investment of past construction projects. A typical rule of thumb is that for every dollar spent on preventative maintenance procedures, six dollars in future construction costs are saved." (*City of Romulus Road Maintenance Program Summary Report*, Orchard, Hiltz & McCliment, Inc., March 2006, p. 1.)

City of Gladstone

In 2003, the Public Works Department of the City of Gladstone was successful in making the case to their elected officials for additional funds. After analyzing the condition of its pavements, the Department found they needed to invest \$180,000 annually over the next 10 years in order to address current deficiencies. However, even at that rate of spending, the overall pavement condition would continue to decline for five years before it started to improve. In order to stop this decline immediately, they would need to increase the \$180,000 to \$220,000. This would necessitate an increase of \$80,000 above what they would use from their Act 51 allotment. In order to make the case to fund this additional amount from other city funds, agency officials presented their plan to the City Commission. The plan provided the Commissioners with a long-term estimate of how much money would be needed annually to achieve the desired condition. By measuring the performance of the system and setting condition targets, the Department was able to clearly present its case to the Commission. The Commission adopted a special assessment to raise the needed funding. The assessment has been renewed for each of the last 3 years.

Appendix A

STATE TRUNK LINE HIGHWAY SYSTEM (EXCERPT) Act 51 of 1951

247.659a Definitions; transportation asset management council; creation; charge; membership; appointments; staff and technical assistance; requirements and procedures; technical advisory panel; multiyear program; funding; records on road and bridge work performed and funds expended; report.

Sec. 9a.

(1) As used in this section:

(a) “Asset management” means an ongoing process of maintaining, upgrading, and operating physical assets cost-effectively, based on a continuous physical inventory and condition assessment.

(b) “Bridge” means a structure including supports erected over a depression or an obstruction, such as water, a highway, or a railway, for the purposes of carrying traffic or other moving loads, and having an opening measuring along the center of the roadway of more than 20 feet between undercopings of abutments or spring lines of arches, or extreme ends of openings for multiple boxes where the clear distance between openings is less than 1/2 of the smaller contiguous opening.

(c) “Central storage data agency” means that agency or office chosen by the council where the data collected is stored and maintained.

(d) “Council” means the transportation asset management council created by this section.

(e) “County road commission” means the board of county road commissioners elected or appointed pursuant to section 6 of chapter IV of 1909 PA 283, MCL 224.6, or, in the case of a charter county with a population of 2,000,000 or more with an elected county executive that does not have a board of county road commissioners, the county executive for ministerial functions and the county commission provided for in section 14(1)(d) of 1966 PA 293, MCL 45.514, for legislative functions.

(f) “Department” means the state transportation department.

(g) “Federal-aid eligible” means any public road or bridge that is eligible for federal aid to be spent for the construction, repair, or maintenance of that road or bridge.

(h) “Local road agency” means a county road commission or designated county road agency or city or village that is responsible for the construction or maintenance of public roads within the state under this act.

(i) “Multiyear program” means a compilation of road and bridge projects anticipated to be contracted for by the department or a local road agency during a 3-year period.

(j) “State planning and development regions” means those agencies required by section 134(b) of title 23 of the United States Code, 23 U.S.C. 134, and those agencies established by Executive Directive 1968-1.

(2) In order to provide a coordinated, unified effort by the various roadway agencies within the state, the transportation asset management council is hereby created within the state transportation commission and is charged with advising the commission on a statewide asset management strategy and the processes and necessary tools needed to implement such a strategy beginning with the federal-aid eligible highway system, and once completed, continuing on with the county road and municipal systems, in a cost-effective, efficient manner. Nothing in this section shall prohibit a local road agency from using an asset management process on its non-federal-aid eligible system. The council shall consist of 10 voting members appointed by the state transportation commission. The council shall include 2 members from the county road association of Michigan, 2 members from the Michigan municipal league, 2 members from the state planning and development regions, 1 member from the Michigan townships association, 1 member from the Michigan association of counties, and 2 members from the department. Nonvoting members shall include 1 person from the agency or office selected as the location for central data storage. Each agency with voting rights shall submit a list of 2 nominees to the state transportation commission from which the appointments shall be made. The Michigan townships association shall submit 1 name, and the Michigan association of counties shall submit 1 name. Names shall be submitted within 30 days after the effective date of the 2002 amendatory act that amended this section. The state transportation commission shall make the appointments within 30 days after receipt of the lists.

(3) The positions for the department shall be permanent. The position of the central data storage agency shall be nonvoting and shall be for as long as the agency continues to serve as the data storage repository. The member from the Michigan association of counties shall be initially appointed for 2 years. The member from the Michigan townships association shall be initially appointed for 3 years. Of the members first appointed from the county road association of Michigan, the Michigan municipal league, and the state planning and development regions, 1 member of each group shall be appointed for 2 years and 1 member of each group shall be appointed for 3 years. At the end of the initial appointment, all terms shall be for 3 years. The chairperson shall be selected from among the voting members of the council.

(4) The department shall provide qualified administrative staff and the state planning and development regions shall provide qualified technical assistance to the council.

(5) The council shall develop and present to the state transportation commission for approval within 90 days after the date of the first meeting such procedures and requirements as are necessary for the administration of the asset management process.

This shall, at a minimum, include the areas of training, data storage and collection, reporting, development of a multiyear program, budgeting and funding, and other issues related to asset management that may arise from time to time. All quality control standards and protocols shall, at a minimum, be consistent with any existing federal requirements and regulations and existing government accounting standards.

(6) The council may appoint a technical advisory panel whose members shall be representatives from the transportation construction associations and related transportation road interests. The asset management council shall select members to the technical advisory panel from names submitted by the transportation construction associations and related transportation road interests. The technical advisory panel members shall be appointed for 3 years. The asset management council shall determine the research issues and assign projects to the technical advisory panel to assist in the development of statewide policies. The technical advisory panel's recommendations shall be advisory only and not binding on the asset management council.

(7) Beginning October 1, 2003, the department, each county road commission, and each city and village of this state shall annually prepare and publish a multiyear program, based on long-range plans, and developed through the use of the asset management process described in this section. Projects contained in each local road agency's annual multiyear program shall be consistent with the goals and objectives of the local road agency's long-range plan. A project, funded in whole or part, with state or federal funds, shall be included in any local road agency's multiyear plan.

(8) Funding necessary to support the activities described in this section shall be provided by an annual appropriation from the Michigan transportation fund to the state transportation commission.

(9) The department and each local road agency shall keep accurate and uniform records on all road and bridge work performed and funds expended for the purposes of this section, according to the procedures developed by the council. Each local road agency and the department shall annually report to the council the mileage and condition of the road and bridge system under their jurisdiction and the receipts and disbursements of road and street funds in the manner prescribed by the council, which shall be consistent with any current accounting procedures. An annual report shall be prepared by the staff assigned to the council regarding the results of activities conducted during the preceding year and the expenditure of funds related to the processes and activities identified by the council. The report shall also include an overview of the activities identified for the succeeding year. The council shall submit this report to the state transportation commission, the legislature, and the transportation committees of the house and senate by May 2 of each year.

Appendix B: Asset Management Council Members

Carmine Palombo, Chair: Carmine is the Director of Transportation Programs for the Southeast Michigan Council of Governments. He is in his second term on the Council and has served as the Chair since the Council's first meeting in October 2002. He represents the Michigan Transportation Planners Association.

Robert D. Slattery, Jr., Vice-Chair: Bob is the Mayor of Mt. Morris, a position he has served in since 1991. Bob is in his first full-term on the Council and represents the Michigan Municipal League.

David Bee: Dave is the Director of the West Michigan Regional Planning Commission. He has been in that position since 2000. Dave is in his first term on the Council and represents the Michigan Association of Regions.

Howard Heidemann: Howard is a County Commissioner from St. Clair County, representing the City of Port Huron. He was first elected in 2002 and re-elected in 2004 and 2006. Howard is in his first term on the Council and represents the Michigan Association of Counties.

William McEntee: Bill is the Director of the Permits & Environmental Concerns of the Road Commission for Oakland County. He has served in that position since 1992. Bill is in his second term on the Council and represents the County Road Association of Michigan.

Susan Mortel: Susan is the Director of Transportation Planning for the Michigan Department of Transportation. She has been in that position since 2002. Susan has been a member of the Council since 2002 and represents MDOT.

Spencer Nebel: Spencer is the City Manager for Sault Ste. Marie. He has been in that position since 1992. Spencer is in his first term on the Council and represents the Michigan Municipal League.

Gerald Richards: Jerry is the Manager of Meridian Charter Township. He has been in that position since 1995. Jerry is in his second term on the Council. He represents the Michigan Townships Association.

Kirk T. Steudle: Kirk is the Director of the Michigan Department of Transportation. He was appointed to that position by Governor Granholm in March of 2006. Kirk has served on the Council since 2002 and represents MDOT.

Rob Surber: Rob is the Deputy Director of the Center for Geographic Services. The Center serves as the Council's data storage agency and is a non-voting member. Rob has been a member of the Council since 2004.

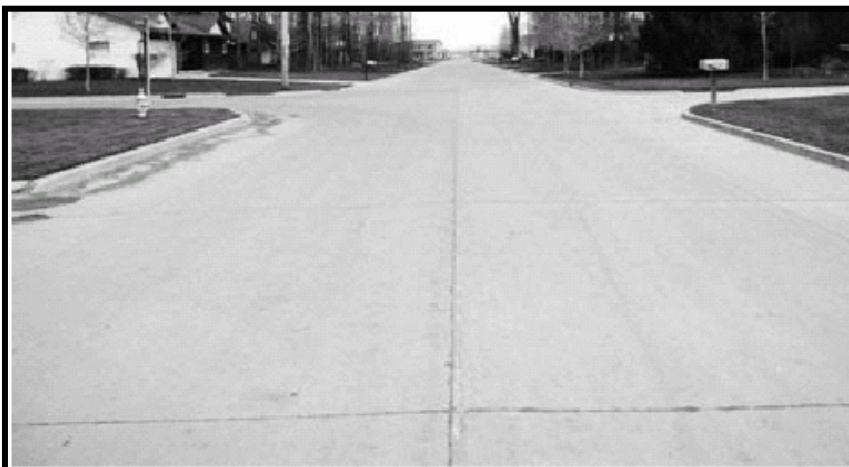
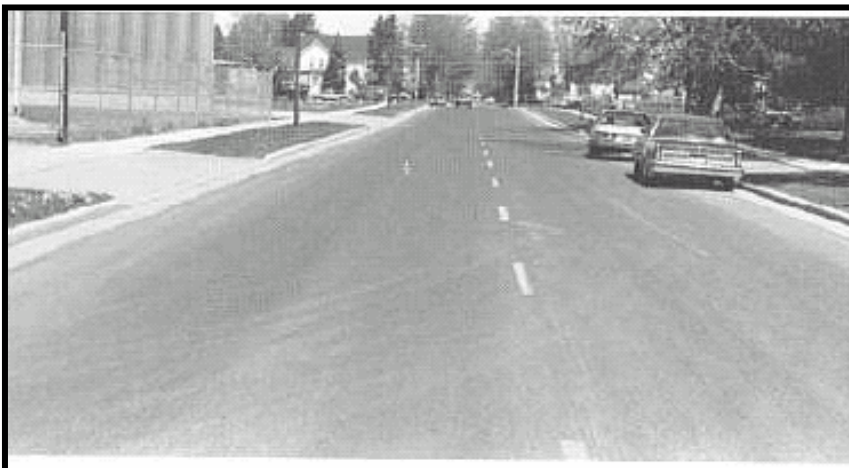
Steve Warren: Steve is the Deputy Director of the Kent County Road Commission. He has served in that position since 1988. Steve is in his second term on the Council. He represents the County Road Association of Michigan.

Appendix C: 2006 PASER Condition Data

2006 NATIONAL FUNCTIONAL CLASSIFICATION

	ROUTINE MAINTENANCE		PREVENTIVE MAINTENANCE		STRUCTURAL IMPROVEMENT		TOTAL	
	Lane Miles	Percent	Lane Miles	Percent	Lane Miles	Percent	Lane Miles	Percent
Freeway	3,396.21	3.65%	5,918.51	6.38%	849.32	0.91%	10,164.04	10.94%
Non-Freeway	9,956.34	10.73%	20,842.93	22.45%	6,740.86	7.26%	37,540.13	40.44%
ARTERIALS	13,352.55	14.38%	26,761.44	28.83%	7,590.18	8.17%	47,704.17	51.39%
COLLECTORS	8,475.88	9.13%	23,015.54	24.79%	13,631.99	14.69%	45,123.41	48.61%
TOTAL	21,828.43	23.51%	49,776.98	53.62%	21,222.17	22.86%	92,827.58	100.00%

Appendix D: Examples of Roads Needing Routine Maintenance



Appendix D: Examples of Roads Needing Capital Preventive Maintenance



Appendix D: Examples of Roads Needing Structural Improvement



Definition of Terms

Bridge Replacement: Removing the old bridge and constructing a new bridge at the same location.

Bridge Recondition or Repair: All types of major repairs including the replacement of the deck.

Capital Preventive Maintenance: Capital preventive maintenance means a planned strategy of cost-effective treatments to an existing roadway system and its appurtenances that preserve assets by retarding deterioration and maintaining functional condition without increasing structural capacity. Work activities and actions that are included as a capital preventive maintenance activity are those that extend the life of the asset, but do not change the original design, function, or purpose of the asset; the primary purpose of the work is to repair the incremental effects of weather, age, and use; the useful service life or benefits extend beyond the next fiscal year; and the work may restore some structural capacity of the road but it does not substantially increase the loading allowed.

Construction: Construction is the building of a new road, street or bridge on a new location, and the addition of lanes to increase the capacity for through traffic. It is the improving of an existing road or street by correcting the grade, drainage structures, width, alignment, or surface. It is the building of bridges or grade separations, and the repair of such structures by strengthening, widening, and the replacement of piers and abutments. It is the initial signing of newly constructed roads or streets, major resigning of projects, and the installation, replacement, or improvement of traffic signals.

Heavy maintenance: The improving of an existing road or street by correcting the grades, drainage structures, width, alignment, surface, and the hard surfacing of gravel roads. It also includes the rebuilding of existing bridges or grade separations, and the repair of such structures by strengthening, and the replacement of piers and abutments.

Maintenance: According to Act 51, “maintenance” means routine maintenance or preventive maintenance, or both. Maintenance does not include capital preventive treatments, resurfacing, reconstruction, restoration, rehabilitation, safety projects, widening of less than 1 lane width, adding auxiliary turn lanes of ½ mile or less, adding auxiliary weaving, climbing, or speed-change lanes, modernizing intersections, or the upgrading of aggregate surface roads to hard surface roads.

Reconstruction: Any construction where the road is totally reconstructed by reditching, new subgrade, subbase, and surface at the same location.

Resurfacing: Resurfacing pavements with minor base repair, minor widening, and resurfacing the existing width. This would include any double or triple seal coating.

Routine Maintenance: Routine maintenance includes actions performed on a regular or controllable basis or in response to uncontrollable events upon a roadway. Work activities or actions considered to be routine maintenance are those where the benefit or effective service life of the work does not last beyond the next fiscal year; the work would not significantly change the surface rating of the road; or the work would rarely require acquisition of right-of-way or site specific design.

Structural Improvement: Structural improvement includes any activity that is undertaken to preserve or improve the structural integrity of an existing roadway. The structural improvement category includes those work activities where the safety or structural elements of the road are improved to satisfy current design requirements. Structural improvement does not include new construction on a new location of a roadway; a project that increases the capacity of a facility to accommodate that part of traffic having neither an origin nor destination within the local area; widening of a lane width or more; or adding turn lanes of more than ½ mile in length.